



Translation of paragraphs of reference 1 (TOKKAI-HEI 9 (1997)-101970 (Laid open into public inspection)) referred to in the office action

[0029]

The invention as claimed in claim 18 is characterized in that the candidate selection means and second candidate selection means include means for displaying a plurality of selected candidate images.

[0030]

The invention as claimed in claim 19 is characterized in that the similar image designating means or the second candidate selection means is repeatedly performed in claim 12, 14 or 17.

[0031]

The invention as claimed in claim 20 is characterized in that means is provided for storing information of candidate selection that includes weighing of each feature value finally obtained after repeatedly performing the similar image designating means or candidate selecting means in the invention of claim 19.

[0045]

The image memory section 5 is comprised of a memory device of large volume such as a write-once optical disk or rewritable optical disk and, as explained later with reference of Fig. 3 in detail, a plenty of images to be retrieved, after data processing, are stored together with their physical feature values in the image memory section 5.

[0047]

Fig. 2 is a figure showing portions of display section and operation section of the image searching device. In this example, display section 2 is comprised of a CRT display device. There is provided a window 10 of a square configuration on the central portion of display 9 of CRT display device and nine candidate images G1 to G9 are displayed within window 10. Reference numerals G1 to G9 are used to indicate candidate images in the following explanation of preferred embodiments, especially in the explanation regarding to Figs. 7 to 11. Within display frame 9, a cursor 14 is displayed as denoted by an arrow. This cursor 14 can be moved to an arbitrary position within display frame by operation of a mouse 15 and, after moving cursor 14 to a position of one of candidate images G1 to G9, similarity designation operation is performed by clicking a switch provided on the mouse 15. A scroll

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bar 11 movable up and down is displayed on the right side edge of window 10. This scroll bar 11 can be moved by operation of cursor 14 and nine candidate images are scrolled according to movement thereof and, thereby, candidate images other than nine candidate images can be displayed within window 10.

[0048]

When the similarity designation operation is done, a similarity mark 12, as indicated with o mark, is displayed on the designated candidate image and, similarly, when the non-similarity operation is done, a non-similarity mark 13, as indicated with × mark, is displayed on the non-similarity designated candidate image. In the meanwhile the non-similarity designation operation can be done, for instance, by clicking the mouse button while pushing a key (for instance a shift key) on the key board, thereby non-similarity designating a candidate image on which the cursor locates at that time. In the example illustrated in Fig. 2, similarity mark 12 is displayed on candidate images G1 and G6, respectively, and non-similarity mark 13 is displayed on candidate images G4 and G6, respectively. Further preservation switch 16 and execution switch 17 are arranged on the right side of the display frame. Execution switch 17 is turned on upon executing searching operation after finishing the similarity and/or non-similarity designation operation and preservation switch 16 is turned on to preserve searching conditions set upon executing search operation. Details thereabout will be explained regarding a flow chart shown in Fig. 5.

[0049]

Next, image registration processing, namely, processing for registering a plenty (for instance 1000 pieces) of images and/or picture samples, is explained with reference to a flow chart of Fig. 3. At first image or picture sample is read in as image data with use of an image scanner 8 (s101), and, from those image data, physical feature values are extracted (s102 and s103). This processing is automatically executed by the central processing device 1. Various image processing such as conversion of density values, removal of noises, edge detection & emphasis, image restoration, extraction of connection and so on (s102) and various feature extraction calculation is done based on the results of the image processing (s103). This feature value may be a quantized physical quantity such as linearity 0.6, contrast degree 0.2, complexity 0.7 or the like. These feature values thus extracted are stored in the image memory section 5 together with the image data read by the scanner correspondingly (s104). The processing mentioned above is repeatedly done for images of 1000 pieces to construct data base in the image memory section.

[0050]

An example of the data base thus formed is shown in Fig. 4. In this example shown in this Fig., an image No. is allocated to each image data and the feature quantity includes number of pixels along a boundary, number of holes, degree of curvature and so on other than the linearity, contrast degree, and complexity mentioned above. This example is mere simplified one and feature scales such as number of colors, color distribution, pixel distribution along a boundary, degree of symmetry, number of needles (in case of embroidery pattern) and so on are employable according to necessity.

[0063]

Coefficient altering processing of s33 and thereafter is done if the present process is search condition generating processing during search cycle of second time or thereafter. The coefficient altering processing is processing for altering coefficients a_1 to an weighing n feature quantities, namely, coordinate axe of n dimensions according to individual importance on the basis of values of coordinate, i.e., feature quantities with respect to the similarity designated and non-similarity designated candidate images. The principle of this processing is as follows. When compared individual feature quantities for a plurality of similarity designated images, there may be classified into feature quantities having a value close to each other and those having a value different with each other. The feature quantity having a value being stable and close to each other among all similar images is that for the searcher to give importance to the feature which might have an expected value. On the other hand, the searcher does not give any importance to the feature quantity having a value different from each other for plural similar images. Thus it becomes possible for the searcher to make a search according to the intention of the searcher by increasing the weighing coefficient of the feature quantity considered important and decreasing that of the feature quantity of no importance.

[0064]

Search processing is a processing for selecting an image data having a short distance between search coordinates and those of the image data as a favorable image. The distance between the search coordinate and those the image data is generally defined as follows;

$$(F01-F11)$$

wherein $F0i$ ($i = 1$ to n) is a value (feature quantity) of each coordinate axis of the search coordinate and $F1i$ is a value of each coordinate axis of the image data.

[0065]

In the present embodiment, weighed distance is calculated using weighing coefficients a_i as follows;

When a_i is large, a difference regarding the corresponding feature quantity is emphasized and the distance becomes large even if the difference is small. Accordingly, the image data having the feature quantity to which a large coefficient a_i is given is close to the search coordinate (namely the difference is small) is selected as a candidate prior to others. To the contrast, the difference corresponding to small a_i does not affect to the distance and the candidate is selected based on approximation of other feature quantity to which a large coefficient is given. Thus a smaller a_i is less important. The search operation is done well reflecting searcher's intention by increasing coefficients given to feature quantities each having a value common to all of plural designated similar images and decreasing those given to feature quantities each having a different value among designated similar images.